

Garbage on the Green

2007-2012 Summary Report



Environmental Center

Environmental Center
University of North Florida
Jacksonville, FL

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Table of Contents

Section 1: Introduction.....	3
1.1 Florida’s Response to Waste Reduction	3
1.2 Introduction to the University of North Florida	4
1.3 Garbage on the Green Background	4
Section 2: Garbage on the Green Methodology	5
2.1 Record Examination	5
2.2 Facility Walk-Through.....	6
2.3 Waste Audit	6
2.3.1 Waste Audit Collection Sites.....	7
2.3.2 Optimal Day and Season for Audit	8
2.3.3 Waste Audit Team Health and Safety Training	9
2.3.4 Volunteer Recruitment	9
2.3.5 Waste Audit Surrogates	10
2.3.6 Waste Audit Procedures	10
Section 3: Waste Audit Results and Analysis.....	11
3.1 Overall Waste Audit Composition	11
3.2 Total Waste Collected by Location	14
3.3 Waste Composition by Type and Potential Diversion Rate.....	17
Section 4: Waste Characterization of Collection Sites	20
4.1 Coggin College of Business (Building 42) 2007-2012	20
4.2 Social Science Building (Building 51) 2007-2012	23
4.3 Courtyard (Alumni Square & Student Union food court) 2007-2012	25
4.4 Osprey Hall (Building Z) 2007-2011 & Osprey Crossings (Buildings Q, R, S) 2012...	28
Section 5: Conclusion	31
Appendix A: Waste Audit Procedures	32
Appendix B: Waste Audit Form	34



Section 1: Introduction

Every year, Florida's 18 million residents and 80 million visitors create approximately 32 million tons of municipal solid waste. From the total waste, only 28 percent of it is recycled. The Florida Department of Environmental Protection (FDEP) has called this situation "simply not environmentally sustainable."¹

Approximately 94 percent of materials extracted for use in manufacturing durable products become waste before the product is manufactured and 80 percent of produced goods become waste within six months of production.² Research has shown that compostable materials, such as food waste and paper, that decompose anaerobically (without oxygen) in a landfill are a powerful greenhouse gas (GHG) emitters and produce methane (CH₄) which has 23-71 times greater heat trapping capabilities than carbon dioxide. The direct link between waste and climate change is undeniable.³

By significantly reducing the amount of waste landfilled and incinerated, the U.S can conservatively reduce greenhouse gas emissions by 406 megatons CO₂ equivalents per year by 2030, which is the equivalent of taking 21 percent of the existing 417 coal-fired power plants off the grid.⁴ A key find in the "Stop Trashing the Climate" report has been that a zero waste approach is one of the cheapest and most effective strategies in reducing the impact of waste on the environment.

1.1 Florida's Response to Waste Reduction

In order to place strong emphasis on waste reduction and recycling, the Florida Legislature passed the Solid Waste Management Act (SWMA) in 1998. The SWMA set a 30 percent recycling goal for every government-funded institution in the state, including State University System (SUS). The act encouraged public and private businesses to invest in infrastructure that would increase recycling and reduce waste. The SWMA was a great step in improving recycling in Florida; however, the State hit a plateau at a 28 percent recycling rate a decade after the bill was introduced.⁵

In 2008, the Florida Legislature passed the Energy, Climate Change and Economic Security Act, which established a new recycling goal to reach 75 percent by the year 2020. The new legislation required all state agencies, including the SUS, to establish and

¹ The Florida Department of Environmental Protection, *75% Recycling Goal Report to the Legislature*, http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf (June 27, 2013).

² Eureka Recycling, *Recycling, Composting and Greenhouse Gas Reductions in Minnesota*, http://www.eurekarecycling.org/pdfs/Composting_Recycling_GreenhouseGases.pdf (June 27, 2013).

³ Ibid.

⁴ Brenda Platt, David Ciplet, Eric Lombardi, and Kate Bailey, *Stop Trashing The Climate*, http://www.stoptrashingthecclimate.org/fullreport_stoptrashingthecclimate.pdf (December 7, 2012).

⁵ http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf



implement “a solid waste reduction program...designed and implemented to achieve the maximum feasible reduction of solid waste generated.”⁶ In addition, the legislation requires state agencies to “evaluate the amount of recyclables and make all necessary modifications...to ensure that all recyclable materials are effectively and practicably recycled.”⁷

1.2 Introduction to the University of North Florida

The University of North Florida (UNF) is a public university located in Jacksonville, Florida with approximately 16,000 students and 2,000 faculty and staff members. Since its founding in 1972, the University has acknowledged the need to protect and preserve the natural environment. Over the years, a number of steps have been taken to both protect the natural areas found on the UNF campus and to reduce its overall environmental footprint.

The UNF Environmental Center was established in 2004 under the leadership of Dr. Ray Bowman, a faculty member from the Department of Chemistry. The mission of the UNF Environmental Center was to develop and foster multidisciplinary environmental education and research at UNF and in the greater Jacksonville community. In addition, the UNF Environmental Center conducts and supports projects to enhance campus sustainability.

In 2010, UNF President John Delaney signed the American Colleges & Universities Presidential Climate Commitment (ACUPCC), pledging UNF to become carbon neutral. Through a series of phases, UNF will become carbon neutral by the year 2050. By doing so, UNF will stabilize and reduce our long-term energy costs, attract excellent students and faculty, attract new sources of funding and increase the support of alumni and local communities.

The University is also a member of the Association for the Advancement of Sustainability in Higher Education (AASHE). In 2012 UNF was recognized by AASHE as a STARS Bronze institution based on its accomplishments in campus sustainability.

1.3 Garbage on the Green Background

To gain a better understanding of the University’s solid waste stream, the UNF Environmental Center, with support from Physical Facilities, decided to conduct a waste audit in 2007. The program would be called ‘Garbage on the Green’, which takes its name from ‘The Green’ a popular common space on the UNF campus. The waste audit would allow Physical Facility staff to gain a better understanding of the solid waste stream and would help guide decisions to improve the University’s overall diversion rate.

⁶ The Florida Senate, XXIX, Chapter 403, Part IV, 403.714(1)(c-d)(5)(a)), <http://www.flsenate.gov/Laws/Statutes/2010/403.714>

⁷ <http://www.flsenate.gov/Laws/Statutes/2010/403.714>

The Garbage on the Green program was developed by Stacy E. Wheeler, a faculty member from the Department of Political Science and an UNF Environmental Center Fellow. The purpose of the program was to identify and quantify the types of materials in UNF's solid waste stream, but would also serve as an educational opportunity to teach the UNF community (students, faculty and staff) about recycling, litter prevention and waste reduction. The program also brings focus to our society's need to use natural resources more wisely. Showing students the vital connection between material use, energy consumption and its impact on climate change is important towards our goal of graduating a generation of environmentally literate society leaders.⁸

In addition to the audit portion of Garbage on the Green, the UNF Environmental Center invites other UNF departments and organizations from the Jacksonville community to participate in the event by providing environmental educational materials and recruiting volunteers for their programs.

The first Garbage on the Green took place on March 8, 2007 and it has grown in scope and size since its inception. According to steering committee members of the National Recycling Coalition's College and University Recycling Council, the first Garbage on the Green event was one of the largest collegiate waste stream audits done on a campus.⁹ The sixth annual Garbage on the Green event took place on October 24, 2012 with 150 volunteers helping sort over 800 lbs of waste. This report will analyze the data collected over the six-year period from 2007 to 2012.

Section 2: Garbage on the Green Methodology

Procedures for Garbage on the Green were adopted from the Environmental Protection Agency (EPA). A waste audit is a technique used to quantify the weight and volume of campus waste. In addition, the audit helped identify each waste component (i.e. plastic, paper, cardboard) and calculate as precisely as possible its percentage of the total solid waste stream. Due to the University's large campus and diverse areas, Garbage on the Green was completed in three phases; record examination, facility walkthrough, and waste audit.

2.1 Record Examination

The first step to better understanding UNF's solid waste stream was to conduct a thorough examination of its waste hauling records and receipts. The goal of the record examination is to show the total amount of waste collected and associated costs. In

⁸ Stacy Wheeler, April Moore, and Ray Bowman, University of North Florida Waste Reduction, National Wildlife Federation Campus Ecology (2008), <http://www.nwf.org/Campus-Ecology/Campus-Search/University-of-North-Florida/Case-Studies/UNF-Waste-Reduction-2008.aspx> (October 5, 2012).

⁹ Ibid.



addition, the examination would allow the University to track and document major contributors to its solid waste stream.

The initial record examination conducted in 2007, led to the realization that UNF lacked a concrete record keeping method. The current method for collection and billing of solid waste combined waste from the entire campus, without identifying the origin of the collected material. Furthermore, the solid waste collected at UNF was combined with solid waste collected from other sites, which made determining the total amount of solid waste produced at UNF nearly impossible. The initial record examination not only highlighted the need for better record keeping, but it also identified inconsistencies with billing and revenues owed to the University on corrugated cardboard.

The discoveries from the initial record examination were brought into consideration when UNF renegotiated its waste-hauling contract in 2008, which included provisions requiring the waste hauler to state the actual weight of trash and recycling collected on the University's monthly bill. With this increase in available data, the University can now calculate a diversion rate, or the amount of waste diverted from the landfill, for the entire campus on a monthly basis. These changes have allowed UNF to increase efficiency, which has also led to cost savings.

2.2 Facility Walk-Through

The records examination provides valuable data, but it does not provide the whole picture. Touring the University's buildings and grounds allowed staff to identify connections between the types of waste generated and the actual waste-generating activities or processes. Identifying these connections allowed the University to find opportunities to implement improved processes, increase efficiency and reduce costs.

Several representatives from the UNF Environmental Center, Physical Facilities, and Environmental Health and Safety participated in the facility walk-through. The timing of the walk-through was especially important in order to provide accurate information. The walk-through was scheduled before trash pickups to allow for a sufficient amount of waste to accumulate and avoided special events such as holidays, because they would produce waste not representative of a normal workday. Notes were made on the size, placement, and contents of both trash and recycling containers in different locations.

In addition to providing more information about the solid waste stream, the walk-through helped identify collection sites that would serve as sample representatives during the waste audit portion of Garbage on the Green.

2.3 Waste Audit

The waste audit is largest component of Garbage on the Green and serves as the public face of the program. A waste audit is a technique used to quantify the components (i.e.



plastic, paper, cardboard) of the waste stream and calculate their percentage of the total solid waste stream. The UNF Environmental Center and Physical Facilities work together in planning the event and hundreds of volunteers help conduct the audit.

Waste is allowed to accumulate on campus for a 24-hour period and is then collected by Physical Facilities staff from the locations recommended through the facility walk-through. The collected waste, which comes from both recycling and trash receptacles, is sorted by volunteers into twelve different categories (see appendix B for more details on the waste categories). Results from the waste audit provide a detailed analysis of the solid waste stream and help University staff make informed decisions on improving the recycling program.

2.3.1 Waste Audit Collection Sites

Due to the size of the University and the large volume of waste created, it is not possible to audit all of the waste. Instead a sample representation is used to make the audit more manageable. The collection sites were chosen during the facility walkthrough, but are discussed every year when planning the waste audit and they have changed slightly as the campus has expanded. In order to get a representative sample, the collection sites represent the varied uses of UNF facilities and include academic and administration buildings, residence halls and dining areas.

The academic and administration areas include the Coggin College of Business and Social Sciences Building, both of which are located on the core campus. These buildings house a number of different academic and administration offices, including departmental offices, classrooms and some laboratories.

The residential area used as representative sample from 2007-2011 was Osprey Halls, which is a traditional dormitory on the core campus. In 2012, the residential area switched to Osprey Crossings, because it had a larger, more diverse student population and was isolated from the other residential areas making it an ideal control subject.

The dining areas used for the study are the Alumni Square and the Student Union food court, both of which are located on the core campus. These areas include dining facilities and common dining areas. Because these areas rely on disposable utensils, cups and plates it is expected to generate a higher amount of remaining trash and food packaging.

Social Sciences Building (Building 51) 2007-2012

The Social Science building was completed in 2007 and is a 68,000 square foot, three-story facility. The Social Sciences Building was the first LEED-certified facility on the UNF campus and was also the first in Northeast Florida. It is home to a number of classrooms and administrative offices for the College of Arts and Sciences and the Departments of Sociology and Anthropology, Political Science and Psychology.



Coggin College of Business (Building 42) 2007-2012

The Coggin College of Business was built in 1996 and is approximately 64,000 square feet. It is a three-story building that houses the Coggin College of Business. The building consists of a diverse set of classrooms and a number of administrative offices.

Osprey Hall (Building Z) 2007-2011

The Osprey Hall opened in 1989 and is a three-story, traditional college residence hall. It is a limited-access building with freedom from cooking and upkeep of a kitchen and bathroom. The rooms provide 180 square feet of carpeted living space and feature large windows overlooking lakefront and wooded scenery.

Osprey Crossings (Buildings Q, R, S) 2012

Osprey Crossings opened for use in 2001 and is a 500-bed, three-building multipurpose facility. Osprey Crossings is a modified suite-style option in which residents share a room with their own private bath, but do not include kitchens. Each building features indoor space for community activities, cooking facilities and laundry facilities.

Alumni Square 2007-2013

Alumni Square is an outdoor courtyard located in the core of the University. The courtyard is a high traffic area and is primarily used by students eating at one of the many surrounding dining service locations.

Student Union Courtyard 2010-2013

The Student Union is a 150,000-square-foot facility and consists of two large structures slightly connected, with an open-air walkway in the center. It opened in 2009 and is the first LEED certified student union in Florida. The Student Union houses the campus bookstore, Student Government, a variety of Student Affairs administrative offices, a food court, full-service restaurant, group meeting spaces, auditoriums and an outdoor amphitheater.

2.3.2 Optimal Day and Season for Audit

A number of factors were considered when making the decision on when to conduct the waste audit, because it is important to collect a sample that is representative of a normal 24-hour period on the UNF campus. Tuesday was chosen as the best representation of a normal day, because it is a mid-week day and most residential students are on campus.



Because Tuesday's waste is audited, the Garbage on the Green event always takes place on a Wednesday.

Choosing a date to conduct the audit was equally important. The winter season (December through February) was discarded, because students stayed in dorms more, generating more waste than normal seasonal temperatures. The summer (May-August) was also discarded because the number of students on campus dramatically decreases. The inaugural Garbage on the Green was conducted during March; however, it was later moved to October for a number of reasons. The presence of Spring Break during March was later determined to have significant impact on an accurate data collection and October avoids major events and holidays. Lastly, the weather was more conducive to sorting trash in October than March, which can be hot and humid in Florida.

2.3.3 Waste Audit Team Health and Safety Training

The waste audit portion of Garbage on the Green presented a number of potential safety concerns, including exposing volunteers to sharp objects (e.g., razor blades, hypodermic needles and broken glass), blood borne pathogens, and other communicable disease. Environmental Health and Safety was consulted during planning to help minimize any risk being introduced to volunteers. From those discussions, a number of measures were taken to protect volunteers from potential hazards.

Prior to participating in the waste audit at Garbage on the Green, volunteers are required to attend a 30-minute training session that focuses on proper waste handling procedures and use of personal protection equipment (gloves, coveralls and protective eye wear), which is provided at the event for all volunteers. In addition, all volunteers are required to sign a volunteer acknowledgment and photo release form before participating in the waste audit.

2.3.4 Volunteer Recruitment

In order to have a successful waste audit it was necessary to recruit as many student volunteers as possible. The volunteers would help promote the event, recruit other students and most importantly participate in the audit. In order to reach as many students as possible, the UNF Environmental Center utilized a variety of advertising methods.

The UNF Environmental Center created a page on its website as a dedicated section for the event, which provided students with information about the event and the volunteer application forms. In addition, the official UNF webpage, electronic billboards and Facebook were used to help recruit volunteers and disseminate updates about the event.

Student volunteers created fliers and posted them in high traffic areas. Volunteers also did street chalking at key locations around campus, such as the library, Student Union Plaza and residential halls. The school newspaper published stories on several occasions regarding the event and its impact on both students and the University as a whole.



UNF Environmental Center staff and volunteers also hosted tables at the Student Union Plaza during Market Days, which is a weekly market with a high volume of student traffic. Student contact information was collected and placed into a student volunteer database. Periodic emails were then sent to the students regarding the event.

2.3.5 Waste Audit Surrogates

In addition to volunteers, the UNF Environmental Center hires a few students to act as “surrogates” during the audit. Surrogates received additional training prior to the event and help ensure that volunteers are following safety procedures and conducting the audit correctly. Having additional staff on site to help answer questions about the waste audit procedures helped maintain consistency and reduce error from being introduced.

2.3.6 Waste Audit Procedures

Step 1: Trash and recycling containers from the sample locations are emptied on Monday evening. Waste is then allowed to accumulate for 24-hours on Tuesday. On Wednesday morning staff from Physical Facilities collects the waste and spray paint is used to indicate what location the bag came from and whether it came from a recycling, trash or bathroom container. The bags are then transported to the waste audit site.

Step 2: As volunteers arrive at the waste audit, they must sign-in and are given personal protection equipment. Volunteers are put into two to four person teams and typically individuals within a team are assigned a specific task. For example, one team member would sort the materials inside the bag, while the other team member would weigh the sorted material and record the results. This approach appeared to be the most efficient way to complete the auditing procedure.

Step 3: After the volunteers put on their personal protection equipment, they are given a clipboard and an audit form (see Attachment B). They then select a bag to audit and record what location it came from and if it is from a recycling, trash or bathroom container. For health and safety reasons, bags that came from the bathroom are weighed, but not audited.

Step 4: Before the bag is opened, volunteers estimate the volume of the bag, weigh the entire bag and record the results. The bag is then placed on the sorting table and opened. Volunteers sort the materials into twelve different categories; mixed paper, white office paper, cardboard, plastic, glass, metal cans, compostable materials, reusable items, electronic waste, hazardous materials, food packaging, remaining trash. For more detailed information about the categories, please see Appendix B.

Step 5: Once all of the materials have been sorted, they are placed one category at a time into a bucket and weighed. Teams are instructed to log the weight of the category minus

the weight of the bucket. This process is repeated for each of the twelve categories or until all items have been measured.

Step 6: After sorting and weighing each category, volunteers return their audit form in order to receive an additional form. This ensures that all forms are collected and students are not misplacing the forms they have already finished. After the event, results are entered into a Microsoft Excel spreadsheet.

For more information on the waste audit procedure see attachment A.

Section 3: Overall Waste Audit Results and Analysis

This section presents results from the Garbage on the Green waste audits between 2007 and 2012. The waste audits were conducted once a year for a total of six audits. This section serves as a general overview of the overall waste stream composition and a detailed analysis of collection site.

3.1 Overall Waste Audit Composition

From 2007 to 2012, a total of 4,494.9 pounds of waste were sorted through the Garbage on the Green program. As seen in Figure 1, mixed paper was the largest category by weight representing 20.1 percent of the overall waste stream. This can be correlated to the high use of mixed paper by the academic areas, including the Coggin College of Business and Social Science Building. Remaining trash was the second largest category with 19.8 percent, followed by food packaging (16.7 percent), compostable materials (12.0 percent) plastics (10.6 percent), white office paper (7.7 percent), cardboard (4.7 percent); glass (2.7 percent), metal cans (2.5 percent), hazardous waste (2.0 percent), Reusable items (0.6 percent) and electronic waste (0.5 percent).

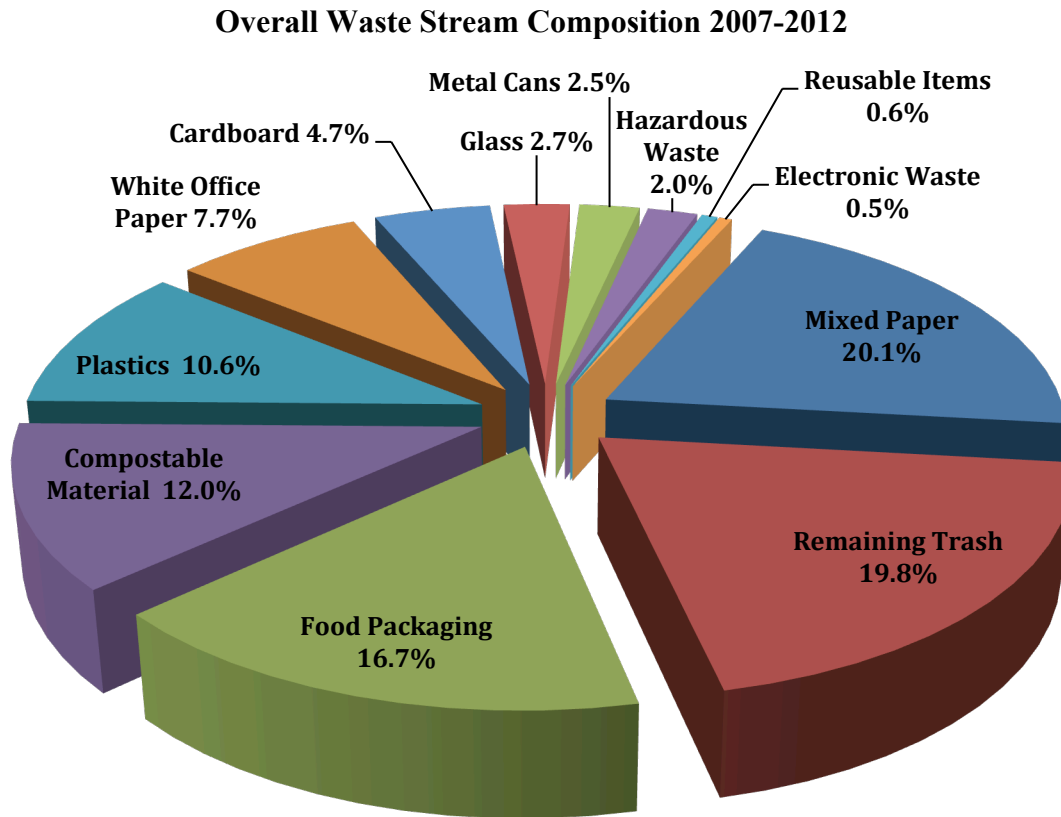


Figure 1: Overall waste stream composition of the waste collected from the five waste generating sites between the 2007 and 2012.

The data in Table 1 represents waste collected from bathroom, recycle and trash receptacles. The overall waste stream composition is separated into twelve different categories and represents the various types of waste found at UNF. It is important to note that only bags from the recycle and trash receptacles were audited. Bags from the bathroom were not audited, because they posed potential health hazards to volunteers. All items collected from the bathroom were weighed and recorded as remaining trash

As seen in Table 1, the total weight of the waste collected during the six waste audits from 2007 to 2012 is 4,494.9 lbs. Of that, approximately 27.1 percent (1,220.2 lbs.) was collected from recycling receptacles and 72.9 percent (3,274.7 lbs.) was collected from trash receptacles.

Waste Category	Total from Recycle Receptacles (lbs.)	Total from Trash Receptacles (lbs.)	Total Waste Collected (lbs.)	Percent of Waste Stream
Mixed Paper	438.1	465.6	903.7	20.1%
Remaining Trash	85.1	805.1	890.2	19.8%
Food Packaging	65.5	683.7	749.3	16.7%
Compostable Material	51.1	489.3	540.4	12.0%
Plastics	160.6	314.8	475.4	10.6%
White Office Paper	188	159.3	347.3	7.7%
Cardboard	133.8	79.2	213	4.7%
Glass	40	80.8	120.8	2.7%
Metal Cans	41.7	68.7	110.4	2.5%
Hazardous Waste	10.5	81.1	91.6	2.0%
Reusable Items	4.1	24.9	29	0.6%
Electronic Waste	1.6	22.2	23.8	0.5%
Total	1,220.2	3,274.7	4,494.9	100.0%

Table 1: Overall Waste Stream by Category 2007 showing the total waste collected from the five waste generating sites separated by the receptacles it from which it was collected.

Of the items collected from recycling receptacles, mixed paper (35.9 percent) represents the largest category, followed by white office paper (15.4 percent), plastics (13.2 percent) and cardboard (11.0 percent). An important issue in relation to recycling collection is contamination, or non-recyclable items located in the recycling stream. When items such as food waste are placed in the recycling stream it makes the recycling process much more difficult and less efficient. What makes this especially important, is that if a collection of recycling is highly contaminated it is often thrown away to avoid complications. According to data from Table 1, 17.9 percent of the items placed in the recycling receptacles were wrongly placed there. These items included remaining trash (7.0 percent), food packaging (5.4 percent), compostable materials (4.2 percent), hazardous waste (0.9 percent), reusable items (0.3 percent) and electronic waste (0.1 percent). While this may seem high, it is not far from the 10 percent threshold considered acceptable by UNF's waste hauler.

Of the items collected from trash receptacles, remaining trash (24.6 percent) represents the largest category, followed by food packaging (20.9 percent) and compostable materials (14.9 percent). While contamination isn't necessarily an issue for trash collection, it is important to know if recyclable items are being thrown away mistakenly. From the data in Table 1, 39.6 percent of all items placed in the trash receptacles could have been recycled or reused. These items include mixed paper (14.2 percent), plastics (9.6 percent), white office paper (4.9 percent), cardboard (2.4 percent), glass (2.5



percent), metal cans (2.1 percent), reusable items (0.8 percent), hazardous waste (2.5 percent) and electronic waste (0.7 percent).

3.2 Total Waste Collected by Location

The waste that was audited during Garbage on the Green was collected from sites located throughout the UNF campus. The sites were identified during the original walkthrough in 2007 and are reevaluated each subsequent year. A total of six distinct collection sites have been used over the six-year period from 2007 to 2012; however, not all sites were audited every year. It should be noted that a small number of audit forms did not indicate a specific location, but were otherwise correctly filled out. These forms were included in the audit results and their location was simply classified as “unknown”. However, since a specific location could not be identified it is impossible to do a meaningful analysis of them as a group.

As was previously mentioned, collectively these collection sites represent the overall campus waste stream. Each collection site represents a specific use type, but some sites can be grouped together based on their similar use. Osprey Crossings and Osprey Hall are both student residence halls. Because Osprey Halls was used for the audit from 2007 to 2011, but replaced by Osprey Crossings in 2012 they are combined into one “Residential” category. The Student Union food court and Alumni Square are both common areas that have a mixed use, but are primarily used for dining. Because both of these areas are similar and neither has been consistently audited, they were combined into one group called “Courtyard” for use in this report.

As seen in Table 2, the Coggin College of Business generated the largest quantity of waste with 1,264.1 lbs., followed by the Social Science Building with 1,135.7 lbs. The Courtyard was the third largest with 982.5 lbs., Osprey Hall was the fourth with 853.2 lbs. and Osprey Crossings (only audited in 2012) was the fifth largest with 217.7 lbs.

In addition, Table 2 shows the actual diversion rate for each location. The actual diversion rate is the total weight of the items collected from recycling receptacles divided by the total weight of all items collected. The Coggin College of Business also had the highest diversion rate at 38.3 percent, followed by Osprey Crossings (33.2 percent), Social Science Building (28.6 percent), Courtyard (23.7 percent) and Osprey Hall (10.9 percent).



Collection Location	Total Waste Collected (lbs.)	Total from Recycle Receptacles (lbs.)	Actual Diversion Rate
Coggin College of Business 2007-2012 (Academic)	1264.1	484.1	38.3%
Osprey Crossing 2012 (Residential)	217.7	72.3	33.2%
Social Science Building 2007-2012 (Academic)	1135.7	324.3	28.6%
Courtyard 2007-2012 (Dining)	982.5	232.6	23.7%
Osprey Hall 2007-2011 (Residential)	853.2	93.0	10.9%
Unknown Location	41.7	13.9	33.3%
Total	4494.9	1220.2	27.1%

Table 2. Overall Waste Collected by Location 2007-2012

The next couple of figures are bar graphs that visually represent the different waste categories by collection site. Since Osprey Crossings replaced Osprey Hall in 2012, they were combined in these figures. Figure 2 represents the items that are recyclable on the UNF campus and include mixed paper, white office paper, cardboard, plastics, glass and metal cans. As seen in Figure 2, the Coggin College of Business produced the most paper, which combines mixed (452.3 lbs.) and white office paper (148.9 lbs.), for a total of 601.2 lbs. Comparatively, the very similar Social Science Building produced only 409.3 lbs. of combined paper. In total, the academic areas were overwhelmingly the largest producers of mixed and white office paper, because they host several classrooms and administrative offices that consume large quantities of paper.

The Courtyard was the largest producer of plastics with 125.0 lbs., which is no surprise because the main use of the Courtyard is as a dining area for restaurants that heavily rely on disposable plastic utensils, cups, bottles and food packaging. The academic areas, Coggin College of Business (120.6 lbs.) and Social Sciences Building (106.1 lbs.), also had high amounts of plastic, most likely due to the large amount of plastic bottles used for beverages.

Recyclables in UNF's Waste Stream by Location 2007-2012

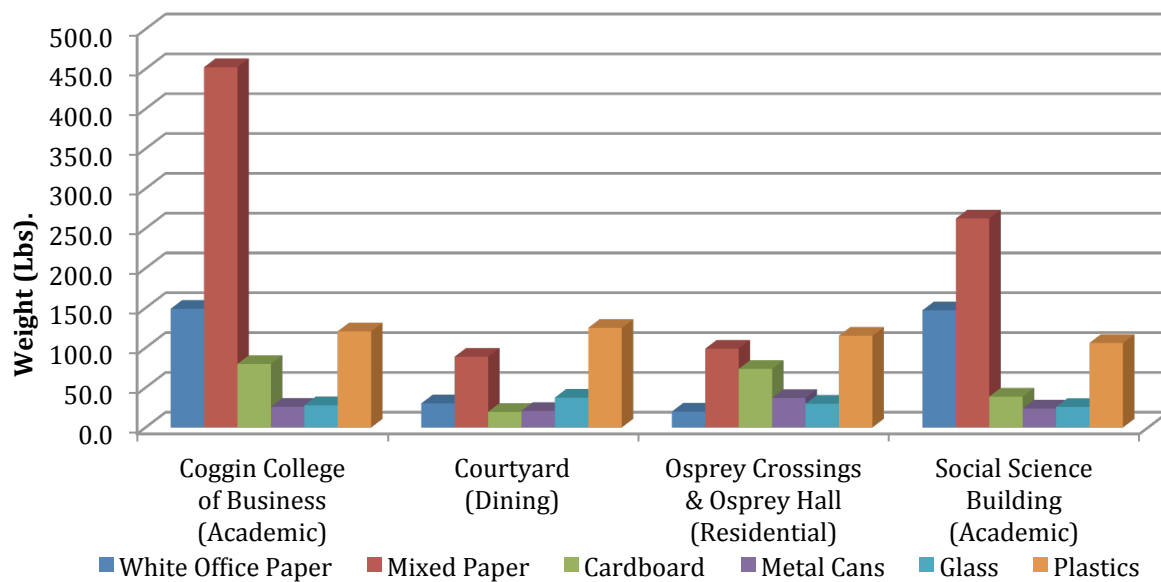


Figure 2: Recyclables in UNF's waste stream by location (2007-2012).

Recyclable items include white office paper, mixed paper, cardboard, metal cans, glass bottle, and plastics.

There are additional items that could be diverted from the landfill, but are not collected in the general recycling at UNF. These items are considered divertible, but not recyclable and include compostable materials, reusable items, electronic waste and hazardous waste. As seen in Figure 3, the Courtyard by far produced the most compostable materials with 201.4 lbs. Since the Courtyard is comprised of two dining areas, the Student Union food court and Alumni Square, it makes perfect sense that these two areas would produce such a high amount of compostable materials. Osprey Hall (105.5 lbs.) recorded the second most compostable materials, followed by the Social Science Building (101.8 lbs.), Coggin College of Business (82.7 lbs.) and Osprey Crossing (41.5 lbs.).

The last figure (Figure 4) represents items that could not be diverted from the landfill and include unrecyclable food packaging and all other remaining trash. As seen in Figure 4, the residence halls created the most remaining trash with 331.8 lbs. and the Courtyard created the most food packaging with 291.2 lbs. Since the Courtyard's main function is a dining area for surrounding restaurants, these results are expected.

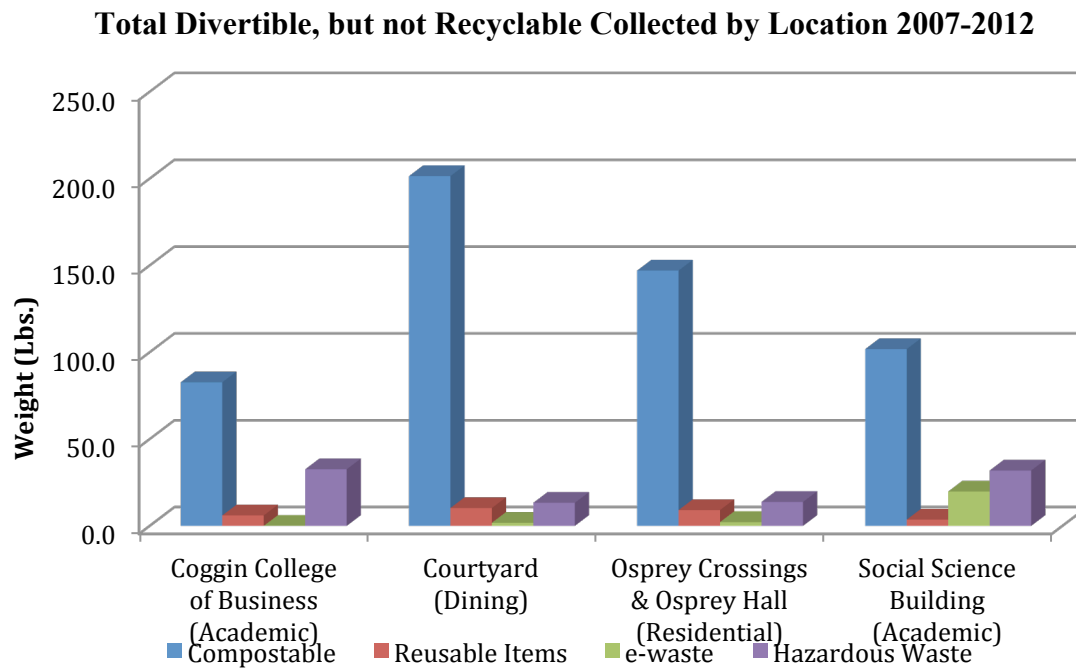


Figure 3: The actual overall divertible, but not recyclable waste collected from the five designated waste generating sites.

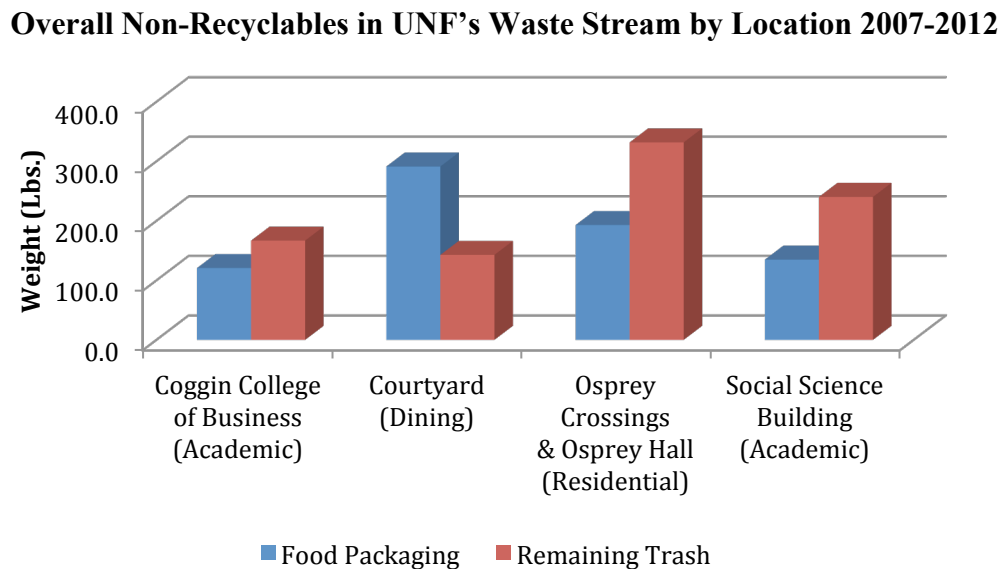


Figure 4: The actual overall non-divertible materials collected from the different locations.

3.3 Waste Composition by Type and Potential Diversion Rate

According to the waste audit findings, a total of 4,494.9 lbs. of waste were sorted from 2007 to 2012. In Figure 5, the total waste collected is separated into three categories: recyclables, landfill and divertible, but not recyclable. This breakdown is based on the type of material collected and not what type of receptacle it was collected from. By doing this, we are able to discuss the maximum potential diversion rates that would be achievable if all divertible items were properly disposed.

As seen in Figure 5, the most significant contribution to the overall waste was recyclables, which totaled 2,170.6 lbs. or 48.3 percent. These results indicate that nearly half of the items in the UNF waste stream are recyclable. However, our diversion rate is only 27.1 percent. By increasing our diversion rate by about 21 percent, nearly half of all the items in the UNF waste stream could be diverted and recycled.

The second largest category was landfill and it composed 1,639.5 lbs. or 36.5 percent of the total waste collected. Items categorized as landfill are food packaging and remaining trash.

The third and smallest category was divertible, but not recyclable and it represents 684.8 lbs. or 15.2 percent of the total waste collected. Divertible, but not recyclable items include compostable materials, hazardous waste, reusable items and electronic waste. This is an important category because these are items that aren't collected in normal recycling, but could be diverted. The majority of this category is composed of compostable materials (78.9 percent), such as food waste. UNF does not currently have a composting program in place, so all compostable materials are sent to the landfill. However, UNF has been exploring opportunities to start a composting program because it represents a significant opportunity to reduce the total amount of waste sent to landfills.



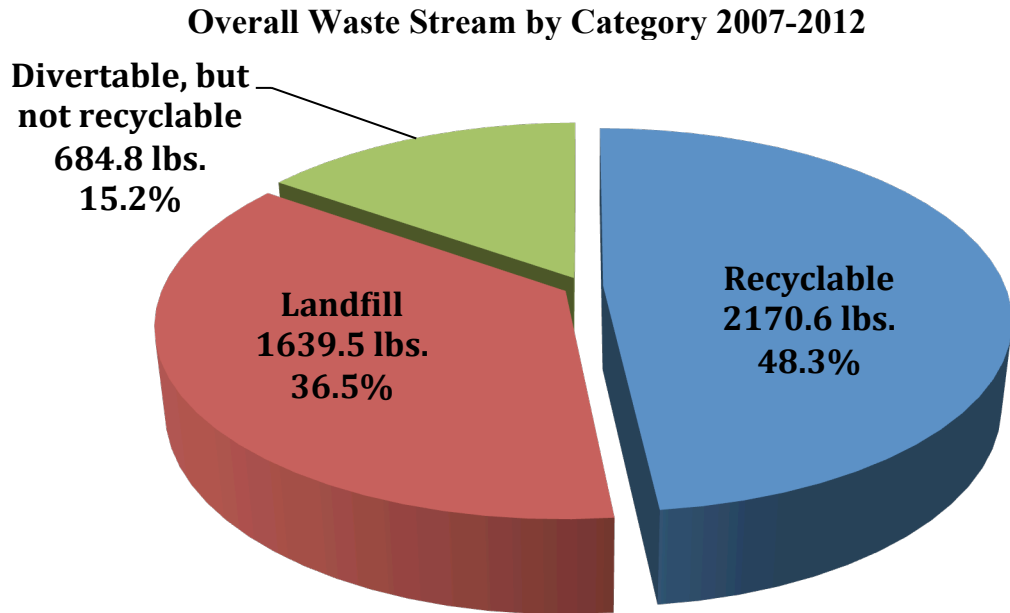


Figure 5: The maximum potential diversion rate based on the data collected from the audit collection locations between 2007 and 2012. The figure divides the total amount of waste collected into three categories: recyclable, landfill and divertible, but not recyclable. This breakdown is based on the type of material collected and not what type of receptacle it was collected from.

As seen in Table 3, the largest amount of waste was collected from the Coggin College of Business (1,264.1 lbs.), which also had the highest amount of recyclable materials collected (855.3 lbs.). The actual diversion rate of the Coggin College of Business was 38.3 percent, but based on data from Garbage on the Green the maximum potential diversion rate is 67.7 percent.

The second largest waste generator was the Social Science Building with 1,135.7 lbs. of total waste and 603.6 lbs. of recyclables. The Social Science building had the second largest potential diversion rate at 53.1 percent, but its actual diversion rate was only 33.2 percent.

The Courtyard, which combined data from the Student Union food court and Alumni Square, had the third largest amount of waste collected (982.5 lbs.). While the Courtyard did not have the lowest actual diversion rate, it not surprisingly had the lowest potential diversion rate. This was not surprising, because most of its waste is food service related and largely comprised of disposable food containers and compostable materials.

While Osprey Hall and Osprey Crossings are both residence halls and have very similar uses, the results from the waste audit showed some very interesting differences. Keep in

mind that Osprey Hall was used as a collection site for the first five years, but then Osprey Crossings replaced it as a collection site in 2012. While both Osprey Hall and Osprey Crossings showed similar maximum potential diversion rates, 34.3 percent and 37.3 percent respectively, they did not show similar actual diversion rates. Osprey Hall had a meager 10.9 percent diversion rate, while Osprey Crossings' actual diversion rate of 33.2% almost matched its potential diversion rate. One explanation for this difference could be the fact that Osprey Hall is comprised of primarily freshman and they may not be familiar with recycling.

Overall Potential Diversion Rates by Location 2007-2012

Collection Location	Total Waste Collected (lbs.)	Total Amount of Recyclables Collected (lbs.)	Maximum Potential Diversion Rate	Actual Diversion Rate*
Coggin College of Business	1,264.1	855.3	67.7%	38.3%
Social Science Building	1,135.7	603.6	53.1%	28.6%
Osprey Crossings	217.7	81.3	37.3%	33.2%
Osprey Hall	853.2	292.8	34.3%	10.9%
Courtyard	982.5	321.8	32.8%	23.7%
Unknown	41.7	15.9	38.1%	33.3%
Total	4,494.9	2,170.7	48.3%	27.1%

Table 3: The total amount of waste generated and the total amount of recyclable materials collected, and the maximum potential diversion rate by collection location.

**Based on information from Table 2.*

Section 4: Waste Characterization of Collection Sites

4.1 Coggin College of Business (Building 42) 2007-2012

The Coggin College of Business had the highest amount of waste collected (1,264.1 lbs.) and also had the highest actual diversion rate (38.3 percent). As seen in Figure 6, mixed paper was the largest category of waste and composed 35.8 percent of the total waste collected. The large percentage composition of mixed paper can be attributed to the academic and administrative function of the building, which requires large quantities of mixed paper, notebooks, notepads, glossy paper, magazines, journals, newspaper, old textbooks and colored paper. Remaining trash was the second largest waste category representing 13.2 percent, followed by white office paper (11.8 percent), food packaging (9.5 percent), plastics (9.5 percent), compostable materials (6.5 percent), cardboard (6.3 percent), hazardous waste (2.6 percent), glass (2.2 percent), metal cans (2.0 percent) and reusable items (0.5 percent).

Coggin College of Business Waste Stream Composition 2007-2012

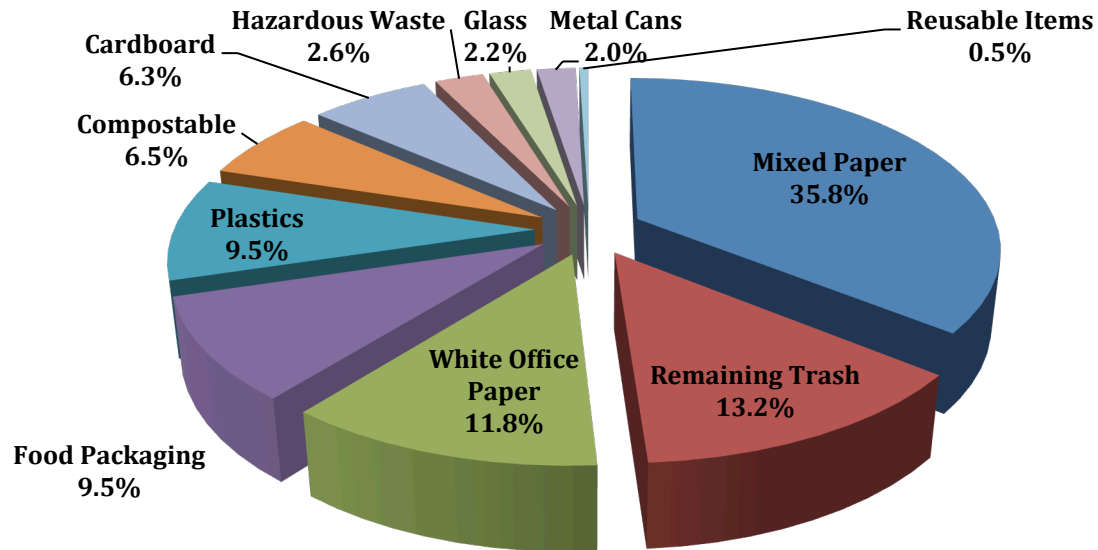


Figure 6: Waste collected from the Coggin College of Business between 2007 and 2012.

The amount of recycling and trash collected from the Coggin College of Business varied from year to year. As seen in Figure 7, waste collected from recycling receptacles in 2007 totaled 73.3 lbs. and by 2008 that number decreased by more than half to 34.6 lbs. However, between 2008 and 2011 it slowly increased to 64.7 lbs. In 2012, the waste collected from recycling receptacles dramatically increased reaching a peak of 217.2 lbs. The dramatic increase of recycling in 2012 from the Coggin College of Business can be attributed to an unusually large quantity of old newspapers that were collected.

The amount of trash collected from the Coggin College of Business also fluctuated annually, but the overall trend showed a significant decrease in trash. As seen in Figure 7, the total amount collected remained relatively stable between 2007 (154.8 lbs.) and 2009 (173.5 lbs.), but experienced a dramatic decrease in 2010 (78.3 lbs.). In 2011 the amount of trash collected increased to 118.3 lbs., but was followed by another decrease in 2012 to a low of 77.3 lbs.

Overall the total amount of waste, combined recycling and trash, has shown both increases and decreases over the past six years. However, the amount of recycling has been increasing while the total amount of trash has been decreasing. This positive trend can be attributed to the fact that a strong and consistent recycling program, overseen by Physical Facilities, is present in the Coggin College of Business.



Coggin College of Business: Recycle, Trash and Total Waste 2007-2012

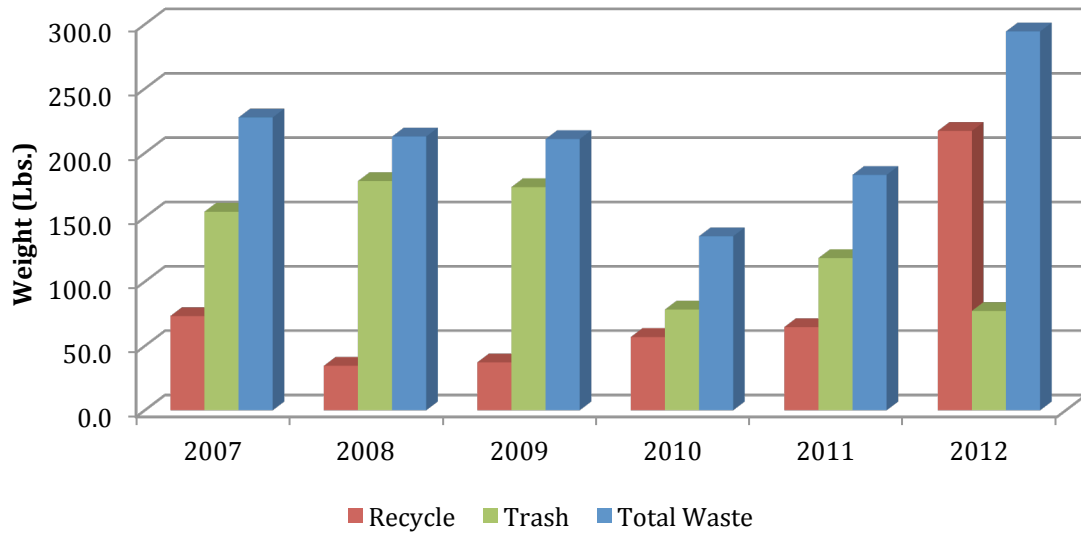


Figure 7: The overall waste stream composition collected from the Coggin College of Business between 2007 and 2012.

Coggin College of Business Overall Waste Stream 2007-2012

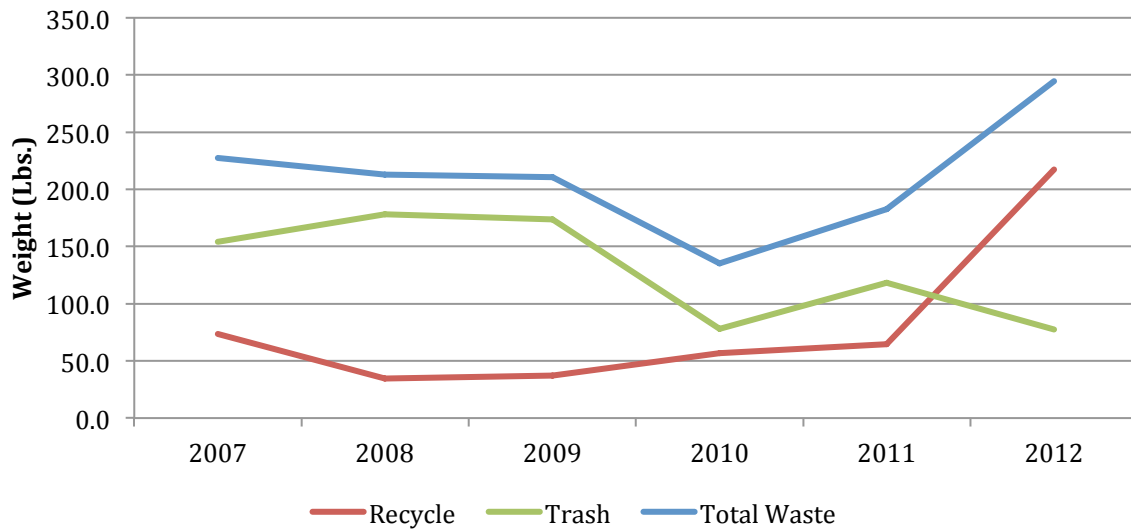


Figure 8: Shown above is the waste collected from recycling receptacles, waste collected from trash and bathroom receptacles, and the total waste collected.



4.2 Social Science Building (Building 51) 2007-2012

The Social Science Building had the second largest amount of waste collected with 1,135.7 lbs. and the second highest actual diversion rate of 28.6 percent. Similar to the Coggin College of Business, mixed paper represented the largest category of waste in the Social Science Building with 23.1 percent. Remaining trash was the second largest category with 21.1 percent, followed by white office paper (12.9 percent), food packaging (11.9 percent), compostable materials (9.3 percent), glass (9 percent), cardboard (3.4 percent), hazardous waste (2.8 percent), plastics (2.3 percent), metal cans (2.1 percent), e-waste (1.7 percent) and reusable items (0.3 percent). The large percentage composition of mixed paper and white office paper (combined total of 36.0 percent) can be attributed to the primarily academic and administrative function of the Social Science Building.

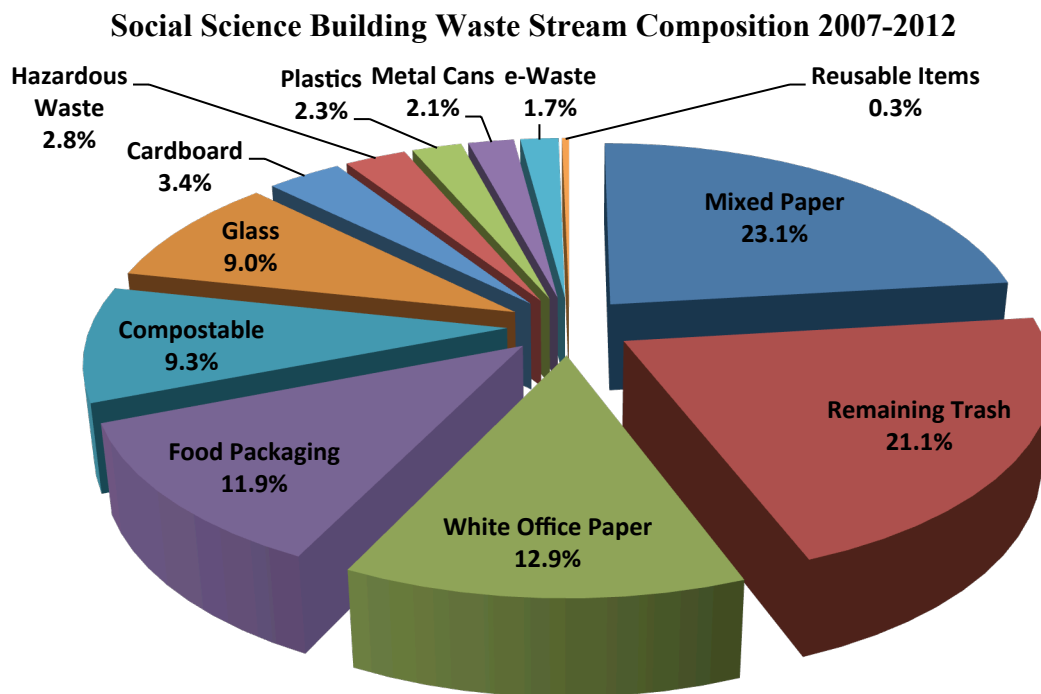


Figure 9: Waste collected from the Social Science Building between 2007 and 2012.

The total amount of recyclables collected varied from year to year and ranged between 36.9 lbs. in 2008 to 79.2 lbs. in 2009. As seen in Figure 10, the total amount of recyclables totaled 73.6 lbs. in 2007. This was followed by a decrease in 2008 to 36.9 lbs. and an increase in 2009 to 79.2 lbs. In 2010, the amount recyclables collected decreased to 43.2 lbs., but the amount increased in 2011 (43.8 lbs.) and 2012 (47.6 lbs.).



The amount of trash collected in 2007 totaled 182.4 lbs., over twice as much as the amount of recycling collected in that same year. The amount trash collected decreased every year after 2007, with the exception of 2009 when collected trash peaked at 242.2 lbs.

As seen in Figure 11, the amount of trash collected and total amount of waste showed an overall downward trend. A positive finding has been the decrease in the amount of trash collected and since its peak in 2009 it has decreased by more than half. The amount of recycling on the other hand has remained relatively stable between 2007 and 2012.

Social Science Building: Recycle, Trash and Total Waste 2007-2012

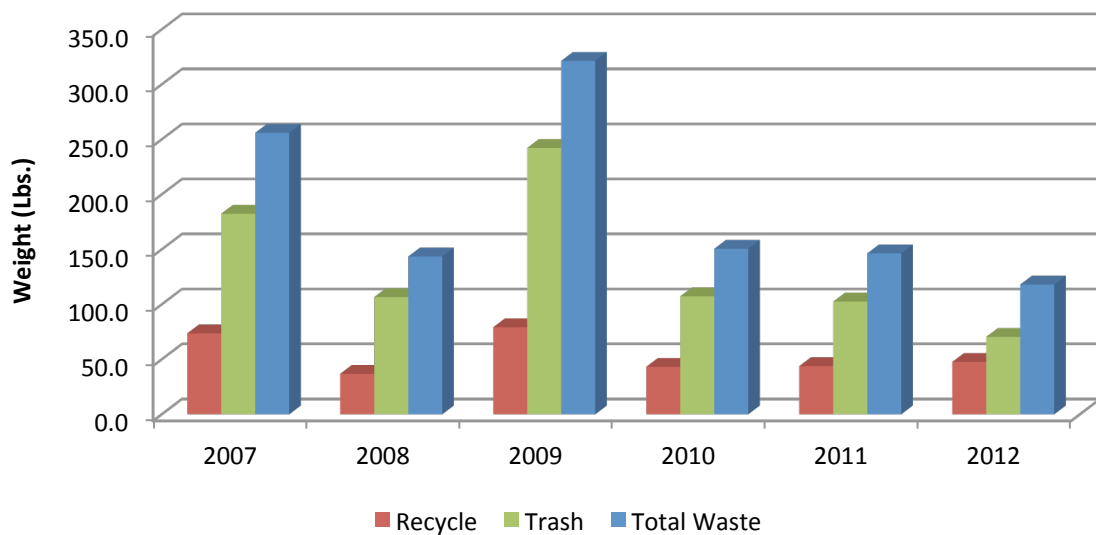


Figure 10: Overall waste stream composition collected from the Social Science Building between 2007 and 2012.

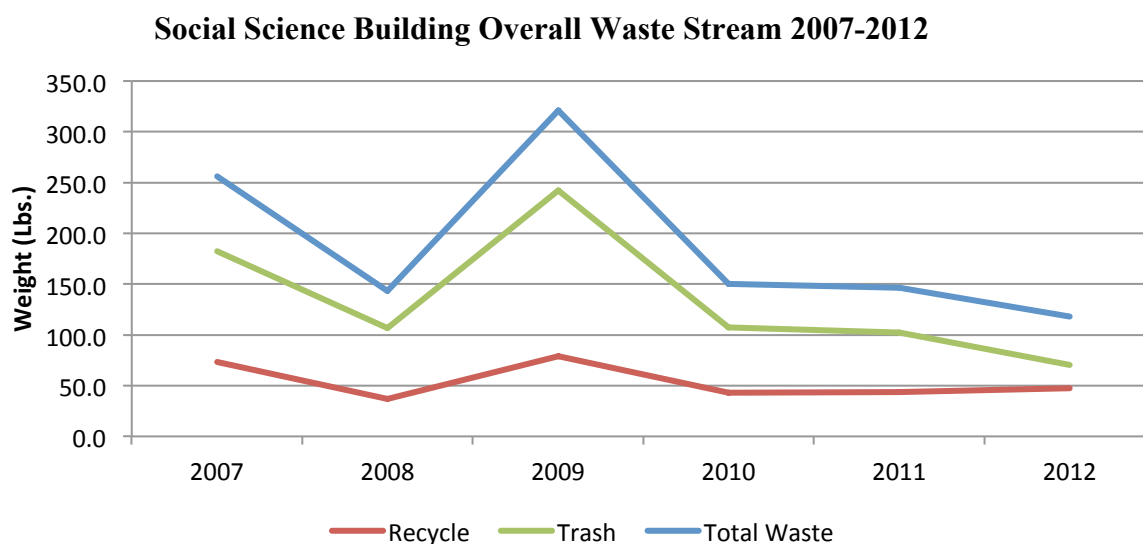


Figure 11: Overall waste stream composition collected from the Social Science Building between 2007 and 2012.

4.3 Courtyard (Alumni Square & Student Union food court) 2007-2012

The Courtyard is composed of two separate, but similar areas: Alumni Square and the Student Union food court. Both are common areas located on the core of the UNF campus and primarily serve as dining areas for surrounding restaurants. The Courtyard was produced the third largest amount of waste (982.5 lbs.) and it had the fourth highest actual diversion rate (23.7 percent).

As seen in Figure 12, food packaging represented the largest category of waste collected from the Courtyard with 29.6 percent. Food packaging included items such as non-recyclable beverage containers, pizza boxes, straws, fast food wrappings, plastic utensils and to-go containers. It is not surprising that food packaging represents such a large portion of the total waste from the Courtyard, because it is primarily a dining area for restaurants that rely heavily on disposable food packaging. The second largest category was compostable materials (20.5 percent), which again was not surprising due to the use of the Courtyard. Compostable materials was followed by remaining trash (14.5 percent), plastics (12.7 percent), mixed paper (9.0 percent), glass (3.8 percent), white office paper (3.1 percent), metal cans (2.1 percent), cardboard (2.0 percent), hazardous waste (1.4 percent), reusable items (1.0 percent) and electronic waste (0.2 percent).



Figure 12: Courtyard Waste Stream Composition 2007-2012

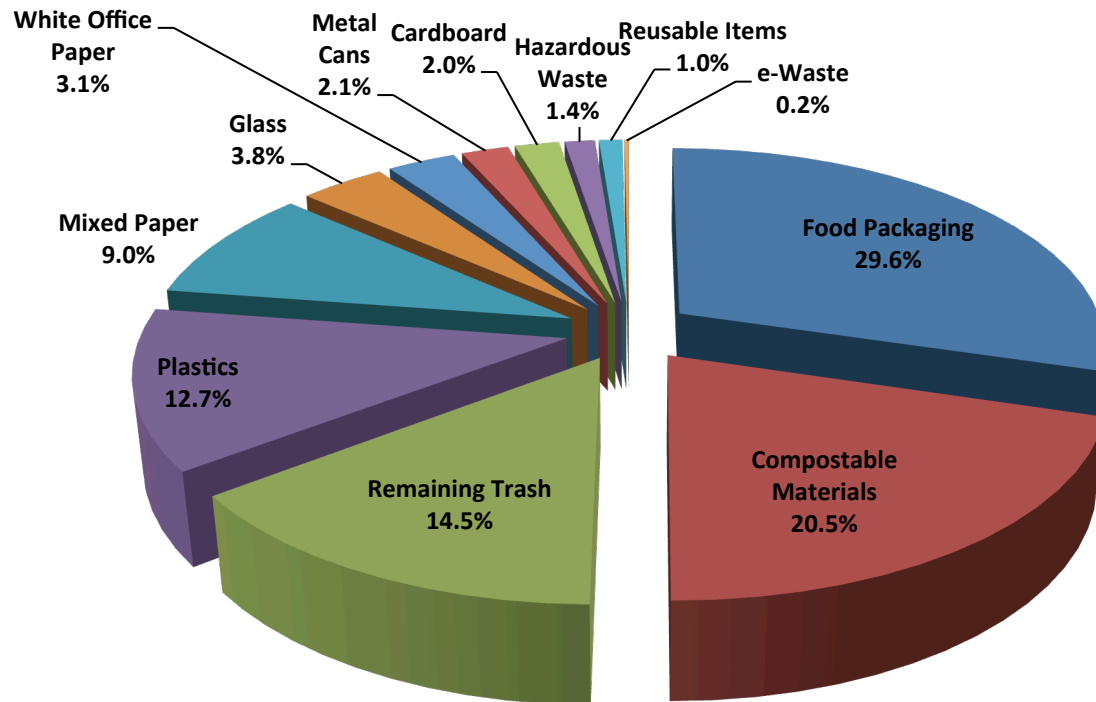


Figure 12: Waste collected from the Courtyard, which includes both the Student Union food court and Alumni Square, between 2007 and 2012.

As seen in Figure 13, the Courtyard only produced 13.5 lbs. of recyclables in 2007, the lowest of any year from that collection site. In fact, trash represented 93 percent of all waste collected from the Courtyard in 2007. The total amount recyclables increased to 40.6 lbs. in 2008, but decreased in 2009 to 33.9 lbs. After remaining relatively stable in 2010 (40.4 lbs.) and 2011 (40.3 lbs.), the total amount of recyclable increased to its peak of 61.6 lbs. in 2012.

The amount of trash collected from the Courtyard fluctuated more than recycling. As seen in Figure 13, the total amount of trash from the Courtyard decreased from 187.3 lbs. in 2007 to 78.6 lbs. in 2009. The amount of trash collected increased and decreased over the next three years and total 113.2 lbs. in 2012.

Overall the total amount of recyclables is slowly increasing, while the total amount of trash is steadily decreasing (see Figure 14). As was previously mentioned, trash represented 93 percent of the total waste from the Courtyard in 2007, but only represented 64 percent of the total waste in 2012. This is a very positive trend, considering the types of materials commonly found at the Courtyard are not recyclable.

Courtyard: Recycle, Trash and Total Waste 2007-2012

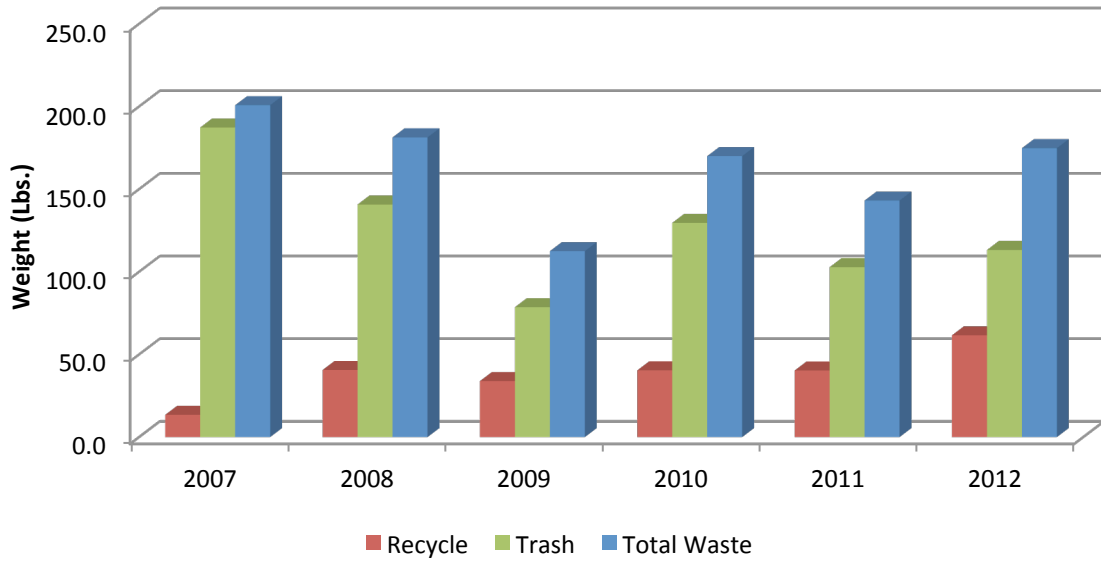


Figure 13: Overall waste stream composition collected from the Courtyard, which includes both the Student Union food court and Alumni Square, between the 2007 and 2012. The graph illustrates the total amount of recyclables and trash collected, as well as the overall amount of waste.

Courtyard Six-Year Trend 2007-2012

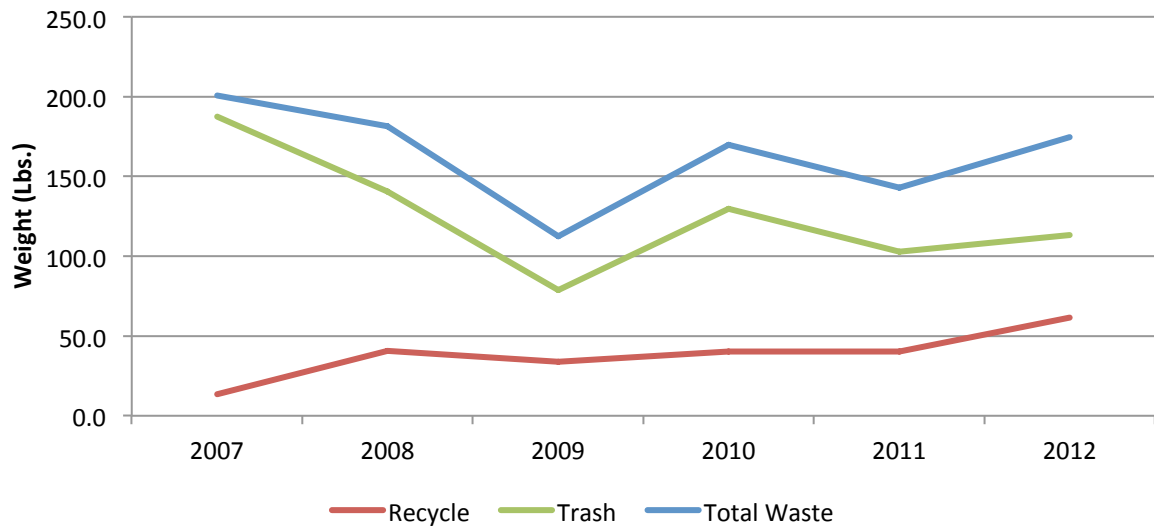


Figure 14: Overall waste stream composition collected from the Courtyard, which includes both the Student Union food court and Alumni Square, between the 2007 and 2012. The graph illustrates three trend



lines; waste collected from recycling receptacles, waste collected from trash and bathroom receptacles, and the total waste collected.

4.4 Osprey Hall (Building Z) 2007-2011 & Osprey Crossings (Buildings Q, R, S) 2012

Over the six-year period from 2007-2012, two separate residence halls were audited. Osprey Hall was used from the initial Garbage on the Green in 2007 until 2011. In 2012, a decision was made to switch the residence hall to Osprey Crossings, because of its larger, more diverse student population and it was isolated from the other residential areas.

The largest category of waste from Osprey Hall, as seen in Figure 15, is remaining trash (32.8 percent). The second largest category was food packaging (18.1 percent), followed by compostable materials (12.4 percent), plastics (10.2 percent), mixed paper (9.7 percent), cardboard (6.6 percent), metal cans (3.2 percent), glass (2.4 percent), white office paper (2.2 percent), hazardous waste (1.4 percent), and reusable items (1.0 percent). There was negligible amount of electronic waste found at Osprey Hall.

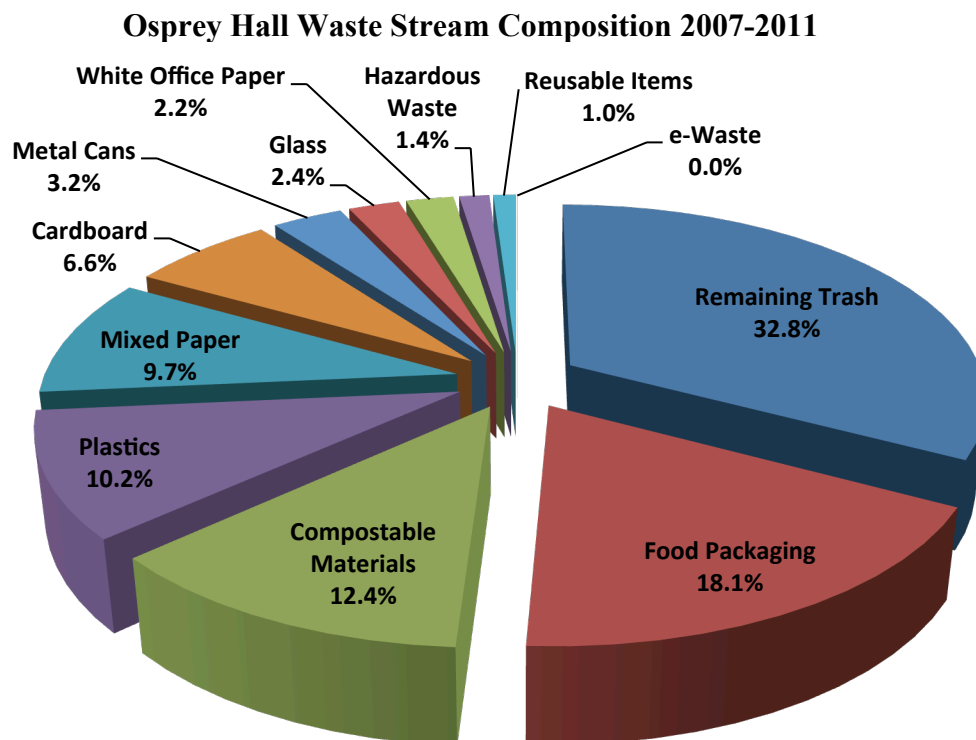


Figure 15: Waste collected from the Osprey Hall between 2007 and 2011.

The waste composition of Osprey Crossings closely resembled that of Osprey Hall. The top three categories of waste from both sites were remaining trash, food packaging and compostable materials. As seen in Figure 16, remaining trash was the largest category of

waste from Osprey Crossings (24.0 percent), followed by compostable materials (19.1 percent), food packaging (17.5 percent) and plastics (12.7 percent).

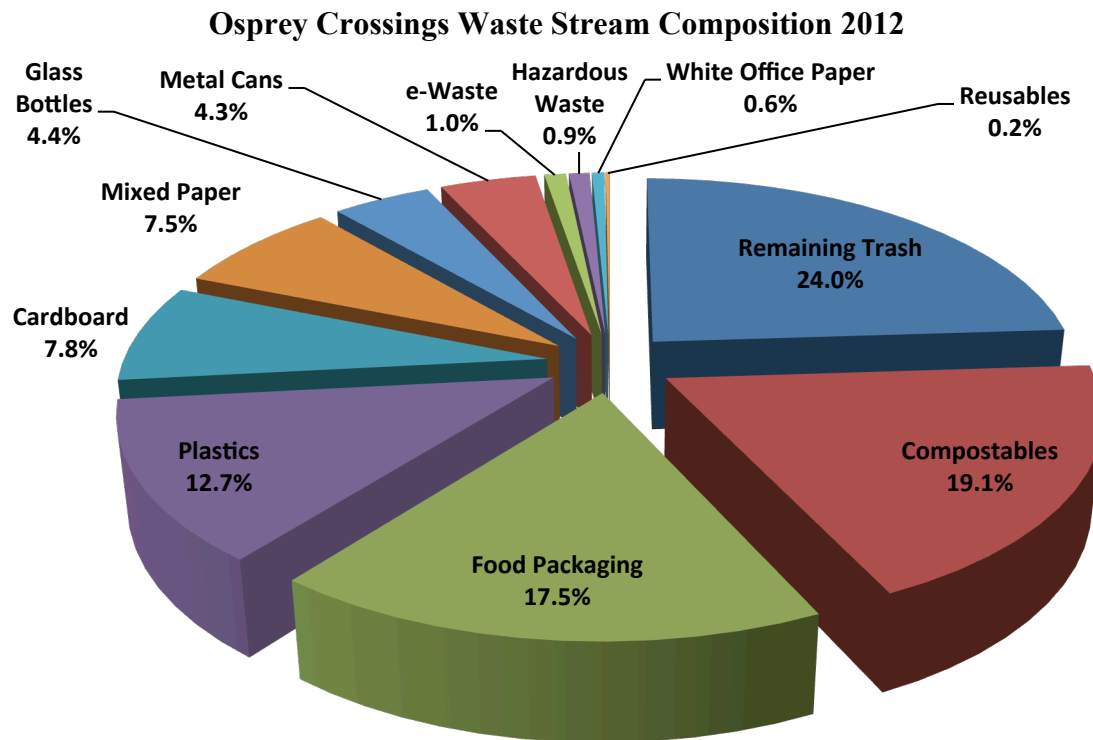


Figure 16: Waste collected from the Osprey Crossings in 2012.

The amounts of trash and recycling collected from the residential areas between 2007 and 2011 fluctuated greatly, with dramatic increases and decreases from year to year. As seen in Figure 17, the amount of recyclable materials ranged between 0.0 lbs. in 2011 and 72.3 lbs. in 2012. The total amount of trash collected ranged from 68.9 lbs. in 2009 to 228.0 lbs. in 2010.

Residence Halls: Recycle, Trash and Total Waste 2007-2012

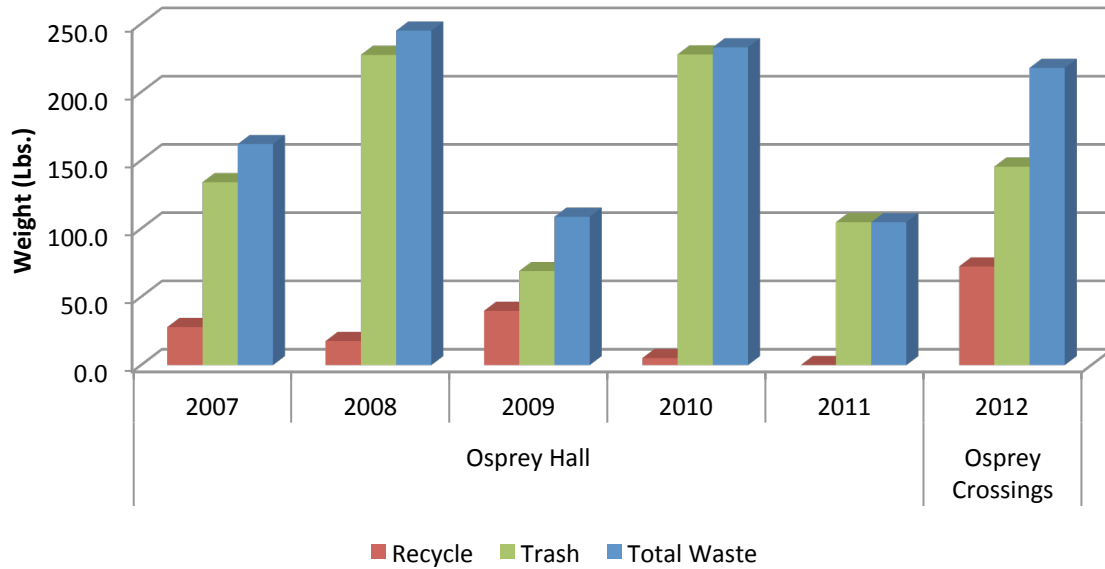


Figure 17: Overall waste stream composition collected from the Residence Halls, which includes data from both Osprey Hall (2007-2011) and Osprey Crossings (2012). Osprey Hall was not audited in 2012 because it was replaced by Osprey Crossings as the residence hall collection site.

Residence Halls Overall Waste Stream 2007-2012

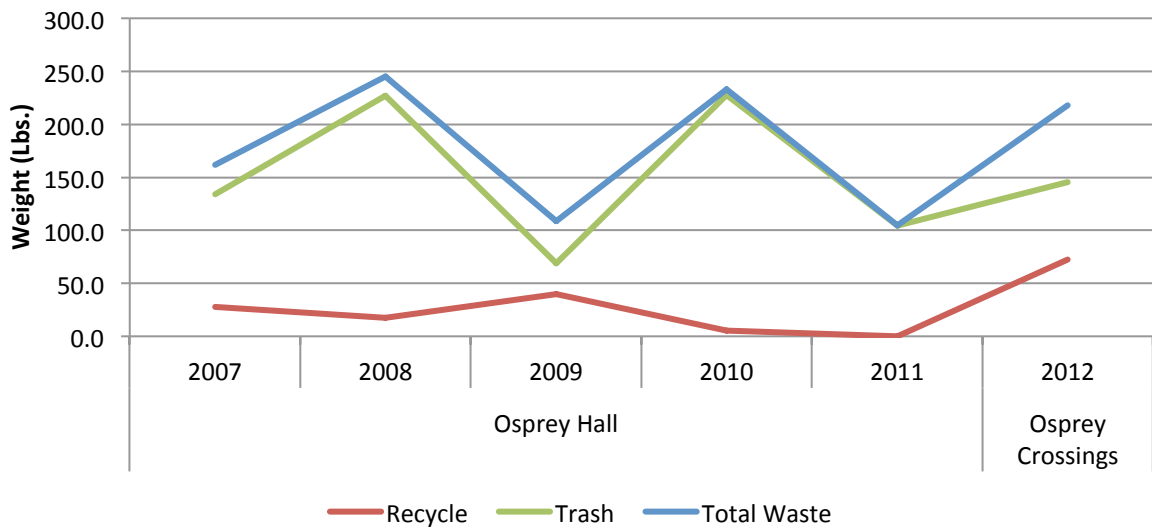


Figure 18: Overall waste stream composition collected from the Residence Halls, which includes data from both Osprey Hall (2007-2011) and Osprey Crossings (2012). Osprey Hall was not audited in 2012 because it was replaced by Osprey Crossings as the residence hall collection site.



Section 5: Conclusion

Overall, the Garbage on the Green program has been successful in helping the university staff better understand the waste stream. This understanding makes it possible to make appropriate changes to minimize the waste stream, increase recycling, and reduce costs. Most of the collection sites have experienced decreases in the amount of trash collected and increases in the amount of recycling. Unfortunately, none of the collection sites came close to the 75 percent recycling goal set forth by the State of Florida, but progress has been made toward achieving that goal.

While most collection sites have shown improvements, it will be important to evaluate why some areas are more successful than others. For instance, Osprey Hall had the lowest diversion rate at 10.9 percent, while the similar Osprey Crossings had the second highest diversion rate of 33.2 percent. Since Osprey Hall is primarily for freshmen, the low diversion rate could be due to lack of recycling education to incoming students. The UNF Environmental Center, Physical Facilities and the Department of Housing and Residence Life have collaborated on ways to improve recycling in the dorms and a number of initiatives are being prepared for the 2013-14 academic year. These initiatives include providing recycling education sessions to resident assistants before move-in and a recycling and sustainability themed event during Week of Welcome called “Don’t Mess the Nest.” Also, the Department of Housing and Residence Life will for the first time be providing recycling bins in all rooms.

The Garbage on the Green program also serves as an educational event aimed at teaching UNF faculty, staff and students about the importance of waste reduction and recycling. The event has grown in size since its inception in 2007 and is one of the biggest events of the fall semester on the UNF campus. As a testament to the event’s success, over 150 volunteers help organize and complete the waste audit every year. Furthermore, a number of outside organizations participate in the event, which helps expand the scope of community education beyond just waste reduction and recycling. Students who interact with these outside groups are rewarded with free food and t-shirts for learning something new about the environment.

The Garbage on the Green program has a strong record of success, but there is always room for improvement. The UNF Environmental Center will continue to look for ways to improve the audit and expand the educational portion of the program. In addition, more focus should be placed on ways to reduce waste rather than only recycling. Efforts to reduce waste are more cost effective and help reduce UNF’s carbon footprint.

Appendix A: Waste Audit Procedures

SAFETY FIRST!

Inspect all items carefully before handling. Be especially careful not to handle broken glass or anything sharp. If you see anything looking vaguely like a hypodermic syringe, stop sorting that bag and let the UNF event coordinators and staff know right away!

A NOTE ON PRIVACY....Discretely look away...

While it's likely that you may read what is written on papers tossed into the trash, we don't have the authorized consent to read it. Please be respectful of someone else's information.

Found Money/Coins

All money will be donated to the Environmental Center or a charity of choice depending on the amount.

Wash Hands...

Make sure to wash your hands thoroughly with soap and hot water after you leave the waste audit site for your health and safety.

1. Put your name(s) on top of each form and fill out all fields accordingly.
2. There are five piles of bags. Select a bag from the pile designated to you by the event coordinator.
3. Each bag audited will have a color painted on it. These colors will tell you the origin of the bag and whether it came from trash, recycling, or bathroom container. Enter bag location on the form.
4. Weigh the **EMPTY** bucket and the beaker on the scale and record the information on the waste audit form.
5. Weigh the entire bag and record the total weight on the top of the form. (NOTE: Record weight to the nearest tenth of a pound for example, 1.0 pound, 12.7 pounds, 102.9 pounds). Also make note of the volume of the bag.
6. Place bag on sorting table. Untie bag or rip open if necessary. If any hazardous, putrescent (i.e. smelly) or infectious waste is present, set bag aside, re-close, and tell the event coordinator/staff that the bag is bad. ****We do not audit bags from the bathroom; just record the total weight and volume.***
7. Sort the contents of the bag by corresponding categories: Place the items into the bucket. Weigh the items on the scale and log the weight, ***minus the weight of the bucket.*** If there are no items in a given category, place a zero for that category weight. Place the items in the corresponding recycling/trash bins.
8. If you find any liquids, for example inside water bottles, pour it into the provided beaker and log the total liquid weight for the entire bag at the end of the procedure.
9. **Repeat step 4 through step 7 for each category!**

DO NOT CONTINUE UNTIL ALL CATEGORIES ARE AUDITED!

10. Use your calculator to add up all the weights in each of the categories. Record total weight at the bottom of page. Total weight plus liquid weight should agree with your 'total bag weight' that you recorded at the top of the form.



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11. Give the completed form to the designated volunteer. Grab a new waste audit form to fill out and start again at step #1 if you have time remaining on your shift.

Before you leave **wash your hands thoroughly...**
Check-out by the Check-in booth when you leave, thank you!!



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Appendix B: Waste Audit Form

BAG AUDIT FORM		Audit Form # _____
Student(s) name _____ Class/Organization name _____		
Bag location (check ONE building): <input type="checkbox"/> #42 Business Admin <input type="checkbox"/> Alumni Square <input type="checkbox"/> The Crossings <input type="checkbox"/> #51 Social Sciences <input type="checkbox"/> Student Union Courtyard		
Bag came from (check ONE): <input type="checkbox"/> Recycling container <input type="checkbox"/> Garbage container <input type="checkbox"/> Bathroom Container		
Total weight of bag (before sorting): _____ lbs.		Volume estimate : _____ (full bag, 1/2, 1/4)
Bucket Weight _____ lbs.	Beaker Weight (liquid container) _____ lbs.	

SEPARATION CATEGORIES

WHITE OFFICE PAPER

(lbs.) _____

OK- printed white office paper **ONLY!** (Color ink OK)

No- glossy paper, magazines, journals, colored paper, envelopes, newspaper, brochures, post-its, food paper (cups or wrappers), personal hygiene material (napkins, tissues, paper towels) etc.

MIXED PAPER

(lbs.) _____

OK- notebooks, notepads, backing to pads, glossy paper, magazines, journals, shoe/shirt boxes, cereal boxes,

chip/paper board, colored paper, envelopes, newspaper, file folders, old textbook, brochures, post-its, etc.

NO- white office paper, cardboard, carbon paper, food paper, napkins, tissues etc.

CORROGATED CARDBOARD

(lbs.) _____

OK- cardboard with wavy material in it (ex. shipping boxes)

NO- shoe boxes, waxy material, cereal boxes, toilet paper rolls, pizza boxes, etc.

METAL CANS

(lbs.) _____

OK- aluminum cans, tin cans, steel cans (labels OK)

NO- aluminum foil, take out containers, paint or stain cans, aerosol cans, etc.

GLASS BOTTLES

(lbs.) _____

OK- all colors of glass

NO- mirrors, light bulbs, chemical containers, vases, broken glass.

PLASTICS

(lbs.) _____

OK- #1-7 bottles and jugs (water, soda, milk jugs)

NO- film plastic, transparencies, take out non-plastic containers.



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COMPOST MATERIALS

_____ (lbs.)

OK- leaves, food, napkins, organics, wood, houseplants, potting soil, compostable cups.

NO- recyclables listed above.

FOOD PACKAGING

_____ (lbs.)

OK- beverage containers (paper, Styrofoam and plastic cups) pizza boxes, straws, aluminum foil, condiments, plastic wrappers, frozen and fast food wrappings, plastic utensils, to-go containers, food packaging.

NO- recyclables.

HAZARDOUS WASTE

_____ (lbs.)

OK- paint, paint thinners, photography chemicals, thermometers, thermostats, drain cleaners, pool chemicals, aerosol cans, pesticides, antifreeze, fertilizer, acids, gun powder, fireworks, etc.

NO- big appliances, regular batteries (go to trash).

ELECTRONIC WASTE

_____ (lbs.)

OK- rechargeable batteries, laptop/button batteries, computer monitors/parts, CPUs, TVs, printers, scanners, stereos, radios, VCRs, DVDs, phones, pagers, power tools, small kitchen appliances (microwaves, toaster oven), beauty appliances (hair dryer),

REMAINING TRASH

_____ (lbs.)

Any non-recyclables and non-compostables

TOTAL WEIGHT _____ (lbs.)
(Total weight of all categories)

LIQUID WEIGHT _____ (lbs.)
(Difference between pre/post audits)

